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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/644,690	08/19/2003	Lieven Stalmans	IMEC232.001DV1	6712

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EXAMINER	
LEE, CALVIN	

ART UNIT	PAPER NUMBER
2825	

DATE MAILED: 03/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/644,690	STALMANS ET AL.	
	Examiner	Art Unit	
	Lee Calvin	2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-9 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6 and 9 is/are rejected.

7)☒ Claim(s) 7 and 8 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/743,076.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

OFFICE ACTION

Claim Rejections - 35 U.S.C. § 102 or 103(a)

1. The following are quotations of the appropriate paragraphs of 35 U.S.C. 102(e) and 103(a) that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 6, and 9 are rejected under 35 U.S.C. 102(e) as anticipated by *Tayanaka (US 6,194,245)* or, in the alternative, under 35 U.S.C. 103(a) as obvious over *Tayanaka* in view of *Mimura et al (US 5,285,078)*.

a) *Tayanaka* discloses a method for fabricating a thin-film opto-electronic device on a conductive silicon-containing substrate **11** [Figs. 3 and 10], comprising the steps of:

- growing on a porous silicon layer **12** [col. 15. ln.25] a non-porous layer **13** that comprises at least first, second, and third regions, wherein the first region (i.e., first semiconductor layer **131**) is doped with p+Si, the third region (i.e., third semiconductor layer **133**) is doped with p-Si (the first region having the same conductivity type as the second region), and the second region (i.e., second semiconductor layer **132**) is doped with n+ Si (different from the first conductivity type of the first and third regions) [Figs. 10 and col. 26]
- forming a sequence of layers such that optical confinement is realized in the device [Fig. 19]

Since *Tayanaka* discloses that layer **12** is a porous silicon layer [col. 14, ln.44], *Tayanaka* inherently teaches or suggest that the layer can act as a light diffuser and a light reflector.

b) Nevertheless, *Mimura et al* discloses a similar opto-electronic device [Abstract] having a porous silicon layer **616** [Fig. 23] that reflects light [col. 27, ln.49].

It would have been obvious to one of ordinary skill to have modified the method of *Tayanaka* by utilizing a function as a light reflector (or light diffuser) of the porous silicon layer because only a semiconductor layer with higher porosity having higher reflecting level.

Furthermore, *Mimura et al* also discloses that a semiconductor layer **622**, doped with p-Si (first conductivity), absorbs a light directing to the LED element **604** [Fig. 23, 26 and col. 27, ln.33] Examiner additionally notes that silicon layer **622** is essentially made of a combination of semi-

conductors with different energy gaps, thus it has a wider spectrum width in light absorption, hence it increases the rate of light absorption (meets claim 2 of the invention).

c) In re claims 3-4, *Tayanaka* also discloses that the non-porous layer is a silicon-containing semiconductor layer, preferably in the group IV (e.g., Si or a SiGe or a Ge layer), being grown by means of molecular beam epitaxy [col. 12].

d) In re claim 6, *Tayanaka* suggests various thicknesses and porosities of the porous silicon layer [cols. 14 and 16], which meet the claimed thickness range and the claimed porosity range.

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Tayanaka*, as applied to claim 1, in view of *Hummel et al (US 5,397,429)*.

Tayanaka is silent about the porous silicon layer being formed by exposing the substrate to an electrochemical treatment or a chemical treatment or spark erosion. *Hummel et al* discloses a porous silicon layer formed by spark erosion method [col. 1].

It would have been obvious to one of ordinary skill to have modified the porous layer formation of *Tayanaka* by utilizing a spark erosion process for the purpose of using a dry technique, which does not involve either anodic etching, or the use of acidic aqueous solutions.

Allowable Subject Matter

4. Claims 7-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. None of the cited arts teaches that a porous silicon layer formed comprises porous silicon parts and columnar conductive parts, and prior to the formation of a porous silicon layer a pattemed mask layer is formed on a substrate to thereby define first and second areas.

Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 from 7:00 to 17:00 (Monday-Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* can be reached at (571) 272-1907

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The fax phones are (703) 872-9318 for regular communications and (703) 872-9319 for After-Final communications.

Calvin Lee
Patent Examiner